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ABSTRACT

This mathematics curriculum guide was developed in response to the need for an updated regional mathematics guide identifying common student performance expectations of the professional staff. The expectations, stated as instructional objectives, have been organized into two major components: (1) an overall "Mathematics Comprehensive Program Guide: K-8 and Algebra I," and (2) a separate "Mathematics Grade Level Guide" designed for each grade level K-8. Each of these two components organizes the objectives into six categories: numeration and numbers, operations, sets and set notation, geometry, measurement, and graphs. For each grade level, the two guide components indicate whether the objective is to be introduced, reinforced, mastered, or continued. Certain objectives are designated as optional. (Author/MK)

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NORTHERN VALLEY REGIONAL HIGH SCHOOL DISTRICT

BERGEN COUNTY, NEW JERSEY

SE 029 380

M A T H E M A T I C S

COMPREHENSIVE PROGRAM GUIDE: K-8

AND ALGEBRA I

1979

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MATHEMATICS GUIDE

APPROVAL LIST

	Approved
Mathematics Study Committee	X
Instructional Council	X
Principals Advisory Group	X
Northern Valley Administrators Association	X
Board of Education:	
Closter	*
Demarest	X
Harrington Park	X
Haworth	X
Northvale	X
Norwood	X
Old Tappan	X
Northern Valley Regional High School District	X

*Pending

PREFACE

This mathematics curriculum guide was developed in response to the need for an updated regional mathematics guide identifying common student performance expectations of the professional staff. The expectations, stated as instructional objectives, have been organized into two major components: an overall Mathematics Comprehensive Program Guide: K-8 and Algebra I and a separate Mathematics Grade Level Guide designed for each grade level K-8.

A major purpose for this guide is to provide a clear framework for the articulation of the mathematics curriculum both within and among the schools of the Northern Valley.

This guide responds to "Thorough and Efficient" requirements in that it provides a sound and firm basis for district-level and program level objectives directly related to the educational goals adopted by school districts in the Northern Valley region. It also provides the foundation for systematic program evaluation.

The mathematics curriculum study project was organized by the Director of Curriculum and Instruction with the assistance of the Northern Valley Principals Advisory Group and with the support of the Northern Valley Administrators Association. The Northern Valley Instructional Council served as an advisory group for the project.

Thirteen teachers representing the seven elementary and one regional high school district were selected for the Mathematics Curriculum Study Committee. All grade levels, kindergarten through twelve, were represented on the Committee.

Mr. Wayne Rosenbaum of the Educational Improvement Center, Northeast served as consultant to the Committee.

Eight meetings of the Committee were held from October 1977 through May 1978. Between meetings, members of the Committee shared working copies of identified objectives with their respective faculties and reported the results of this sharing process with the Committee at the next meeting.

The Committee, working on a complex and substantial task with a short time-line and sometimes under difficult conditions, diligently moved the project toward its completion. Differences regarding the performance expectations were openly discussed, and professionally resolved.

A note of appreciation is extended to all of the teachers in the eight districts who contributed their suggestions regarding the guide, to the superintendents and principals of the Northern Valley schools for their cooperation in this project, and to the eight boards of education for their support which makes possible the contribution of such projects as this one to curriculum articulation and improvement in the region.

The work of the Committee members and their sincere concern for the quality of the product of their efforts is much appreciated. A special thanks is due Maureen (Heffernan) McKay who carefully and thoroughly edited the final draft of the guide.

Finally, an expression of gratitude is in order for the dedicated and skillful assistance provided by Mrs. Ann Bischoff, Secretary, and Mrs. Mary Flammer, Clerk-Typist, who patiently typed, and retyped final drafts as well as duplicating and assembling copies of this guide.

Edward A. Ciccoricco

EAC/ab

Edward A. Ciccoricco, Director,
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Consultant: Wayne Rosenbaum, Educational Improvement Center, Northeast

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Director of Curriculum and Instruction

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INTRODUCTION

The mathematics curriculum guide consists of two components: an overall Mathematics Comprehensive Program Guide: K-8 and Algebra I and a separate Mathematics Grade Level Guide designed for each grade level K through 8. Each of these two components organizes the objectives into six categories: numeration and numbers, operations, sets and set notation, geometry, measurement, and graphs.

For each grade level, the two guide components indicate whether the objective is to be introduced, reinforced, mastered, or continued. Certain objectives are designated as optional. In using these guide components, it is most important to read the explanation of the code (which follows this section).

A concept or a skill may be introduced earlier than indicated in the Guide, given appropriate conditions of student ability and readiness.

The Guide was developed in terms of the "average" student. Some students will need additional instruction to meet the expectations indicated for the various levels. Some modification of the expectations may be necessary for particular students. For other students, the suggested expectations will be seen as a base upon which enrichment and more advanced curriculum experiences can be developed.

The Committee considered two major factors in the development of this Guide. First, the appropriateness of each instructional objective to the developmental stage of the average student in each grade level. Second, the appropriateness of instructional objectives in the scope and sequence of a K-8 mathematics program.

The Guide can also be helpful in the selection of instructional materials for a mathematics program. The Guide was developed with no one particular textbook series or "package" in mind. The performance expectations listed in this Guide are basic to a mathematics program. Therefore, a variety of mathematics resource materials will be compatible with the Guide.

The Curriculum Library has a collection of mathematics instructional resources which may be borrowed by elementary and secondary professional staff. These resources include films, sound filmstrips, textbooks, and professional books on teaching methods. Catalogs describing instructional films, mathematics materials, and other resources are also available.

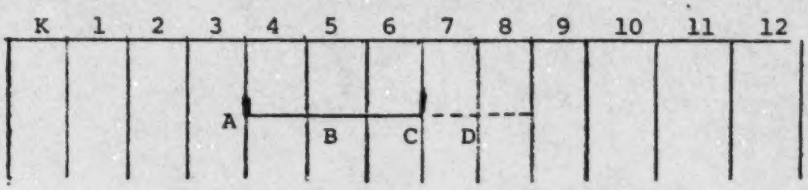
It is planned that this Guide will be reviewed and evaluated periodically. Suggestions for revisions are invited.

PROGRAM GUIDE EXPLANATION

In the Program Guide, the line following each skill indicates the span of grade levels (see column headings) at which that skill is taught. A solid line begins where the skill is introduced, continues through the grades where it is being reinforced, and ends where the skill is mastered. A broken line indicates the grade levels at which that skill is continuing to be reviewed after mastery. A line of "o's" shows the span of grade levels for an optional skill. (The width of each column shows the span for that grade level.)

Examples:

IV B2 Identify right angles



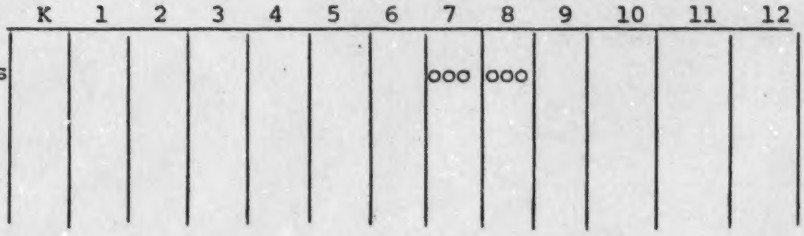
A. Introduced at grade 4

B. Reinforced in grade 5

C. Mastered at grade 6

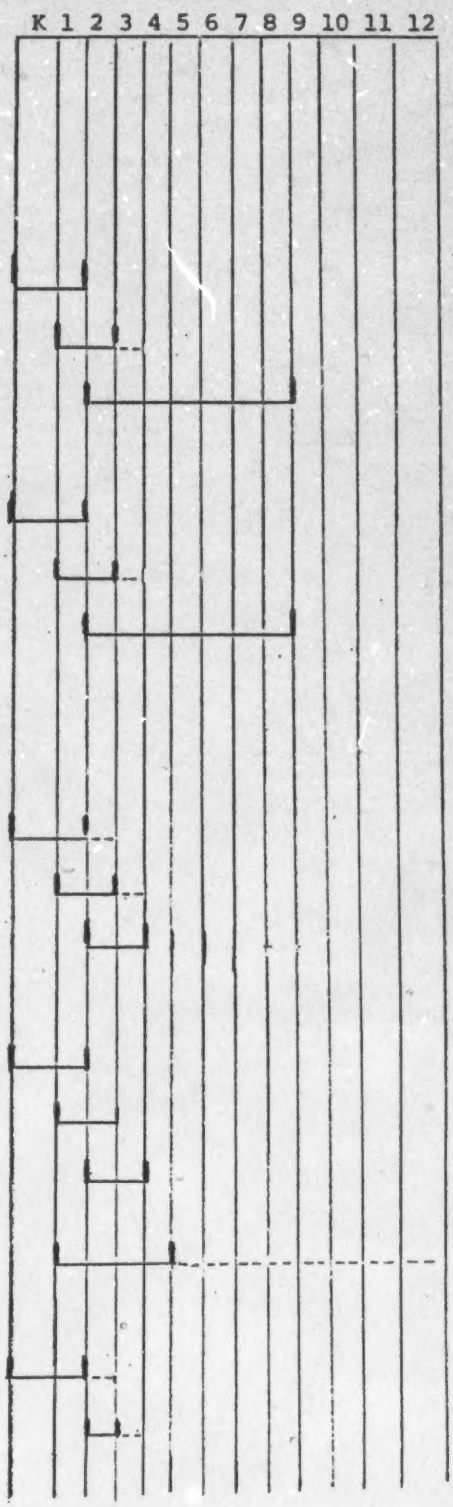
D. Continuing to review through grades 7 and 8

VI E1 Draw histograms



Optional for grades 7 and 8

PERFORMANCE EXPECTATIONS FOR K-8 AND ALGEBRA I



I. NUMERATION AND NUMBERS

A. Numeral Expressions

1. Write a numeral when given its name:

   a. 0 to 10

   b. 11 to 99

   c. 100 to trillions

2. Name a numeral when given its symbol:

   a. 0 to 10

   b. 11 to 99

   c. 100 to trillions

B. Cardinal and Ordinal Numbers

1. State the numeral naming the number property of a collection:

   a. ≤ 9

   b. $10 \leq 99$

   c. 100 to 200

2. Count objects orally:

   a. ≤ 9

   b. $10 \leq 99$

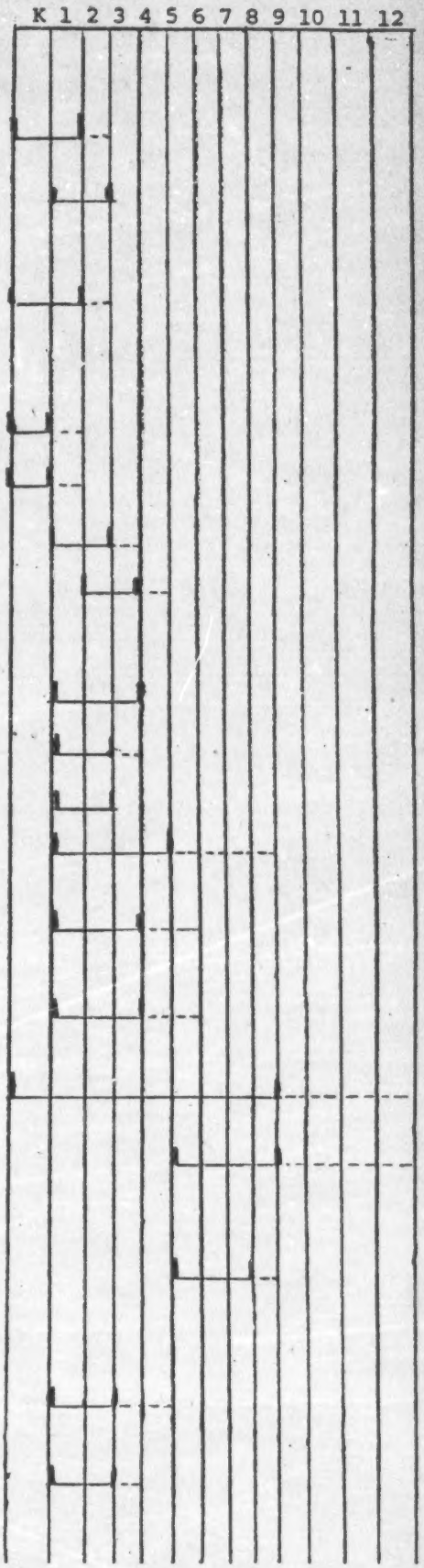
   c. 100 to 200

3. Using the symbols $>$, $<$, $=$, compare number properties of collections ≤ 200

4. Join, separate and compare sets

   a. ≤ 10

   b ≤ 18



5. Name the ordinal numbers associated with indicated marks or objects:

   a. ≤ 9

   b. $10 \leq 35$

6. Given a collection of no more than ten objects, arrange them in order from smallest to largest and <u>vice versa</u>

7. Count by ones (rote counting):

   a. 1) 0 to 9 using objects and pictorial representations

      2) 0 to 9 rote counting

   b. 10 to 99

   c. 100 to 1,000

8. Skip count by multiples of:

   a. 2's

   b. 5's

   c. 10's

9. Identify odd and even numbers

10. List even numbers from 2 through 100 (up to 20 for first grade)

11. List odd numbers from 1 through 99 (up to 20 for first grade)

12. Recognize patterns in, and add to or complete number sequences or charts

13. Find the least common multiple of three or more given numbers

14. List all the ways of writing a composite number (not itself and prime as only factors) as the product of two factors

C. <u>Place Value</u>

1. Recognize that there are 10 digits in our decimal numeration system

2. Indicate the number of tens and ones in a two-digit number

3. Indicate the number of hundreds, tens and ones in a three-digit number

4. Indicate the place value of each digit in a number from one thousand to billions and read and write the numeral name:

   a. to the millions

   b. to the billions

5. Write a standard numeral in expanded notation:

   a. $\leq$ 99

   b. 100$\leq$999

   c. $\geq$ 1,000

6. Write an expanded numeral in standard form:

   a. $\leq$ 99

   b. 100$\leq$999

   c. $\geq$ 1,000

7. Rewrite four or more digit numerals in expanded form using exponential notation (powers of 10)

8. Rewrite four or more digit numerals using scientific notation ($9.9X10^2$)

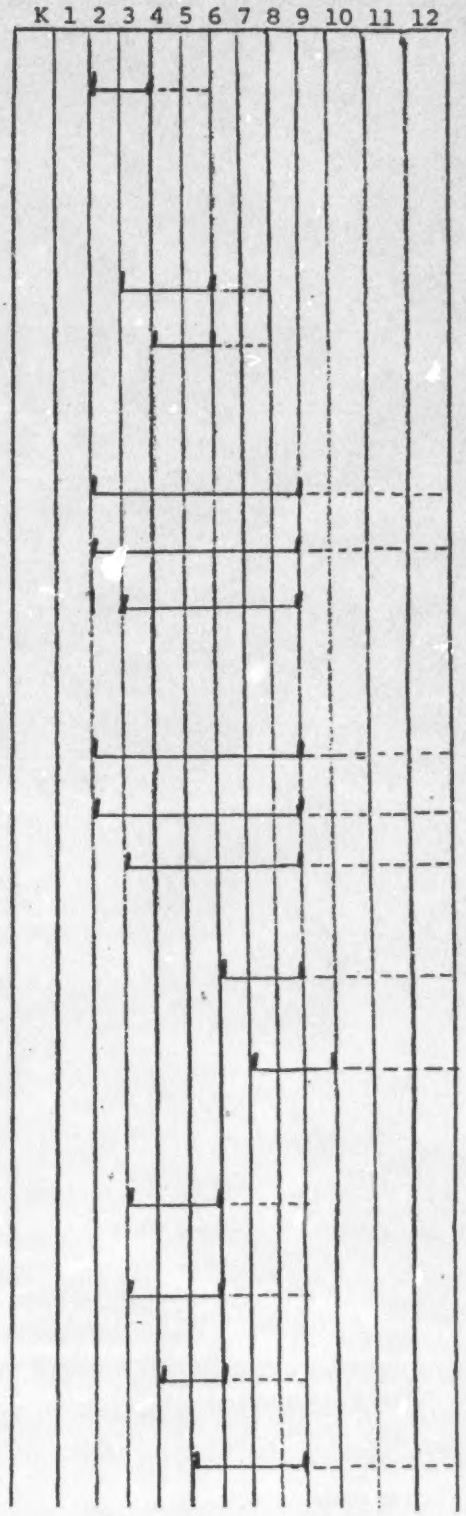
9. Rewrite:

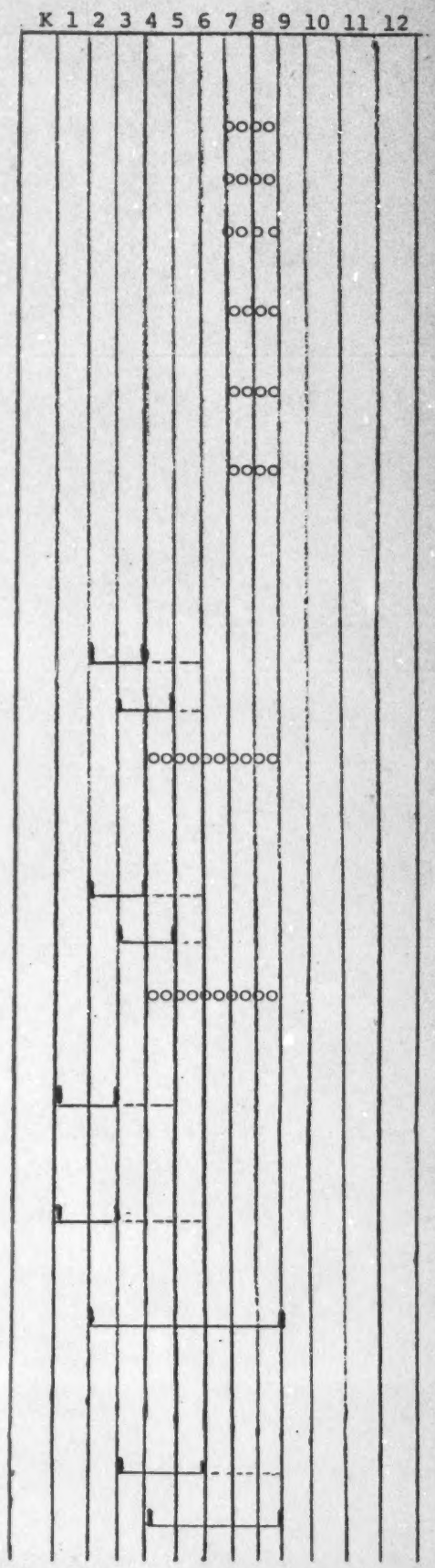
   a. two-digit numerals rounding to the nearest ten

   b. three-digit numerals rounding to the nearest hundred

   c. four-digit numerals rounding to the nearest thousand

   d. 10^n digit numerals rounding to any specified place





10. Demonstrate ability to count in base $_n$:

    a. n = 2 to 9 inclusive

    b. n = eleven

    c. n = twelve

11. Write a base$_n$ numeral in expanded notation

12. Convert a base $_n$ numeral to base $_{10}$ and vice versa

13. Demonstrate ability to perform the four basic operations with base $_n$ numerals

D. Roman Numerals

1. Convert Roman numerals to Hindu-Arabic numerals:

    a. up to 39

    b. up to 89

    c. up to 5,000

2. Convert Hindu-Arabic numerals to Roman numerals:

    a. up to 39

    b. up to 89

    c. up to 5,000

E. Common Fractions

1. Identify numerals $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$

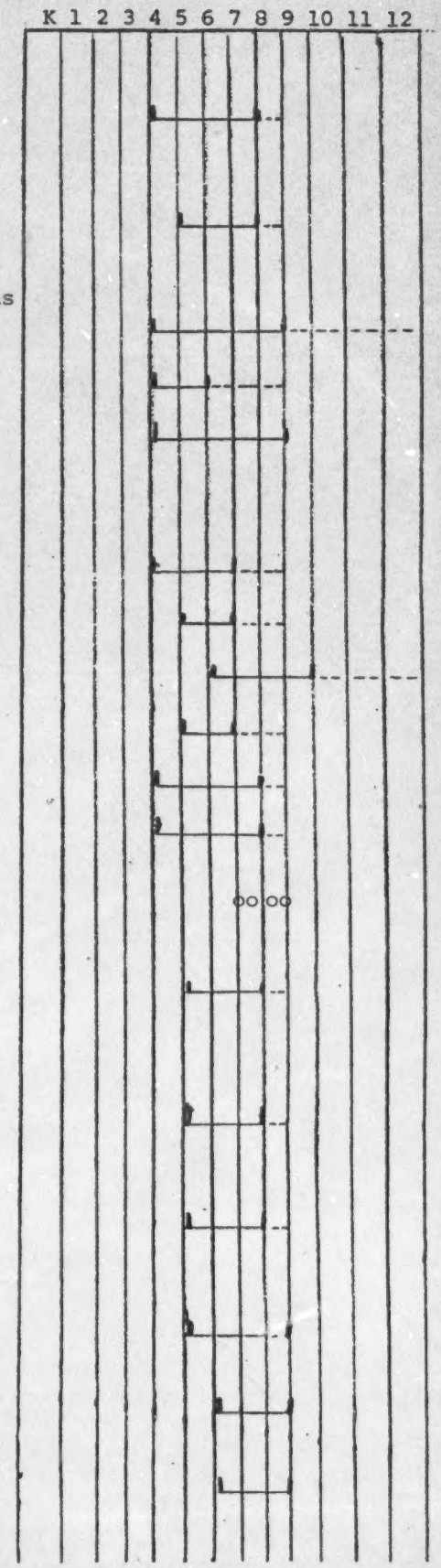
2. Associate the numerals $\frac{1}{2}$, $\frac{1}{3}$ or $\frac{1}{4}$ with pictorial separation of whole objects into halves, thirds or fourths

3. Write the fraction symbol for any part of a given whole (halves, thirds, fourths for second grade)

4. Given two or more fractions, use the symbols $<$, $>$, or = to indicate their ordinal position relative to each other:

    a. like denominators

    b. unlike denominators



5. Given any fraction, write at least two equivalent forms

6. Express a decimal fraction as a mixed number or as a common fraction having a denominator of 10, 100, 1000, 10^n

7. Represent by a ratio what part a given number of objects is of a total set of objects (three forms of a ratio - $\frac{2}{8}$, 2:8, 2 to 8)

8. Name and identify the parts of a fraction

9. Write a fraction representing the ratio of a given part to the whole

10. Identify and interpret the meaning of:

    a. proper fractions

    b. improper fractions

    c. complex fractions

    d. mixed numbers

11. Reduce fractions to lowest terms

12. Rename mixed numbers and improper fractions

13. Classify given numbers as rational or irrational

14. Find the least common denominator for a given group of fractions

F. <u>Decimal Fractions</u>

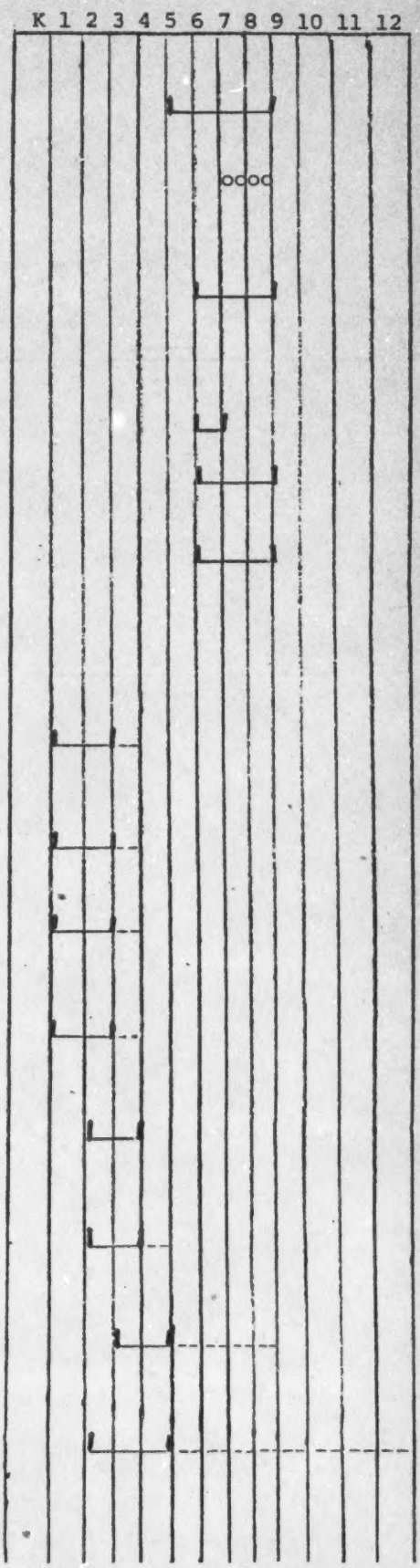
1. Identify the place value of each digit of a decimal (through thousandths)

2. Given a decimal (through thousandths), express the decimal in words and as a common fraction

3. Change any common fractions having denominators of 10, 100, 1000, 10^n to decimal fractions

4. Change fractional numerals of the form a/b where $a<b$ to decimals

5. Change fractional numerals of the form a/b where $a>b$ to decimals



6. Express terminating decimal fractions as common fractions reduced to lowest terms

7. Express repeating decimals as equivalent common fractions

8. Express any given decimal fraction in expanded notation, (negative exponents - optional)

G. Percents

1. Read or write in words numerical expressions ending with a percent sign

2. Convert a decimal fraction to a percent

3. Convert a percent to a decimal or common fraction

II. Operations

A. Addition of Whole Numbers

1. Name the number property of two disjoint sets and of their union

2. Know the basic addition facts through sums of 18 (instant recall; up to 10 for first grade Mastery)

3. Understand the use of 0 as the additive identity element

4. Add two two-digit addends without regrouping when the figures are presented vertically or horizontally

5. Add three or more three-digit addends without regrouping when the figures are presented vertically or horizontally

6. Add two two-digit addends with regrouping when the figures are presented vertically or horizontally

7. Add three or more three-digit addends with regrouping when the figures are presented vertically or horizontally

8. By applying the commutative and associative properties of addition, find the sum in an addition exercise

9. Name and identify the sum of an addition exercise

10. Write an equation for word problem involving addition and find the answer appropriate to the grade level

11. Demonstrate ability to estimate an answer

B. Subtraction of Whole Numbers

1. Name the number property of the union of two sets and demonstrate the alternative number properties of the disjoint sets which could have formed the union

2. Know the basic subtraction facts (minuend ≤ 18; instant recall; up to 10 for first grade mastery)

3. Subtract two and three-digit numbers in which no regrouping is required when the figures are presented horizontally or vertically

4. Subtract numbers larger than three digits in which no regrouping is required when the figures are presented horizontally or vertically

5. Subtract two and three-digit numbers in which regrouping is required when the figures are presented horizontally or vertically

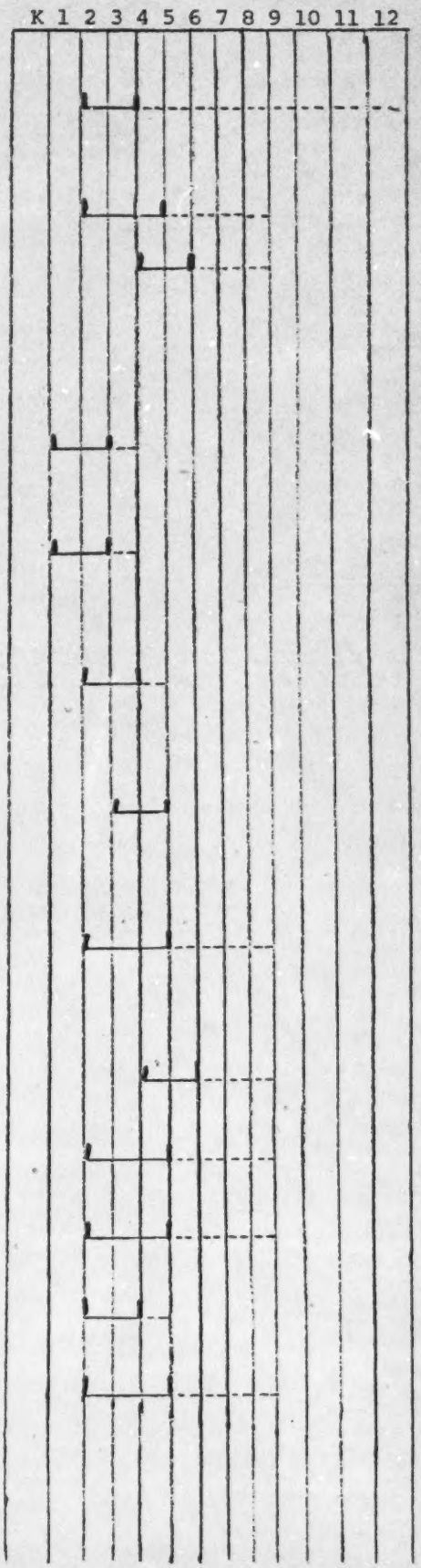
6. Subtract numbers larger than three digits in which regrouping is required when the figures are presented horizontally or vertically

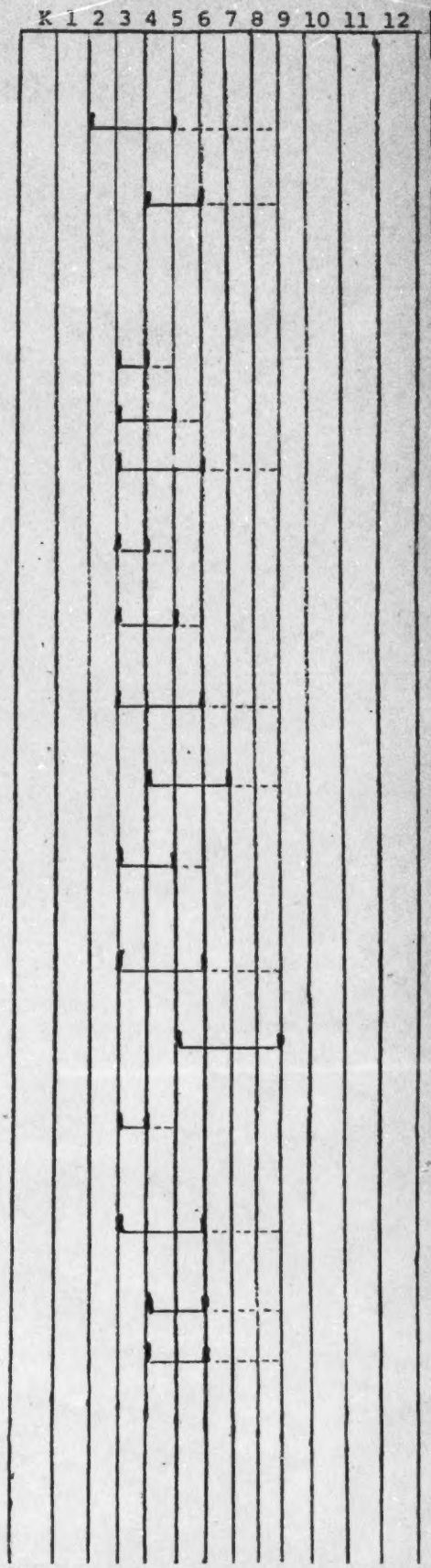
7. Name and identify the difference in a subtraction exercise

8. Write an equation for a word problem involving subtraction and find the answer

9. Find the missing addend given one addend and the sum in an addition exercise

10. Check a subtraction exercise using addition





11. Demonstrate understanding of the inverse relationship of addition and subtraction

12. Demonstrate ability to estimate an answer

C. Multiplication of Whole Numbers

1. Learn the basic multiplication facts:

   a. through 5 X 5

   b. through 9 X 9

   c. through 12 X 12

2. Understand and use 1 as the multiplicative identity element

3. Multiply a two or three-digit number by a one-digit number

4. Multiply a two or three-digit number by multiples of 10, 100 or 1,000

5. Multiply a two or three-digit number by a two or three-digit number with regrouping

6. Recognize and use the commutative property

7. Recognize and use the associative property by showing alternatives for finding the product of a series of multiplications

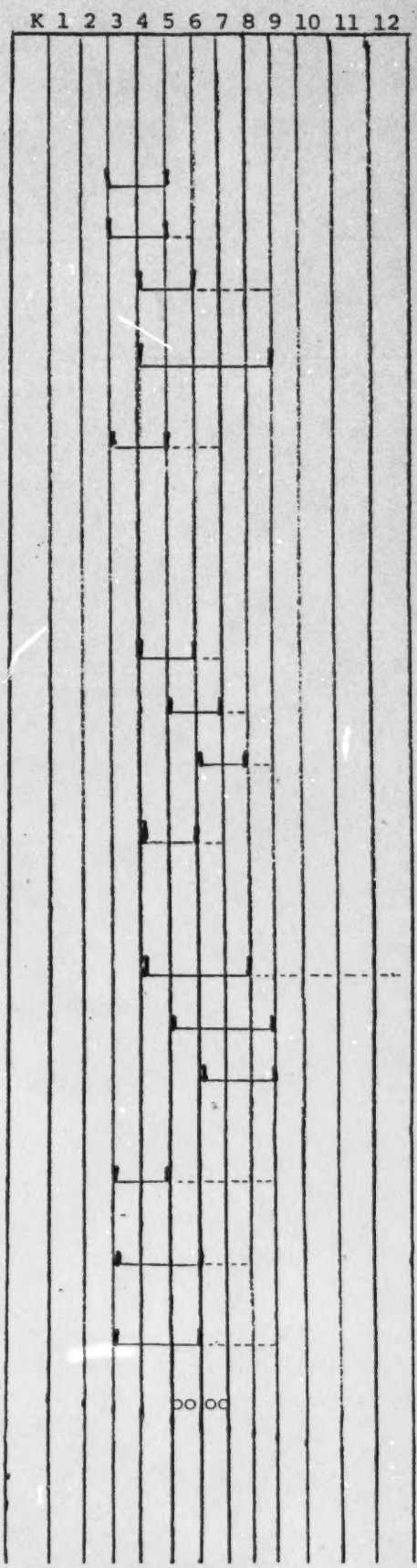
8. Recognize and apply the distributive principle

9. Name and identify the parts of a multiplication exercise

10. Write an equation for a word problem involving multiplication and find the answer

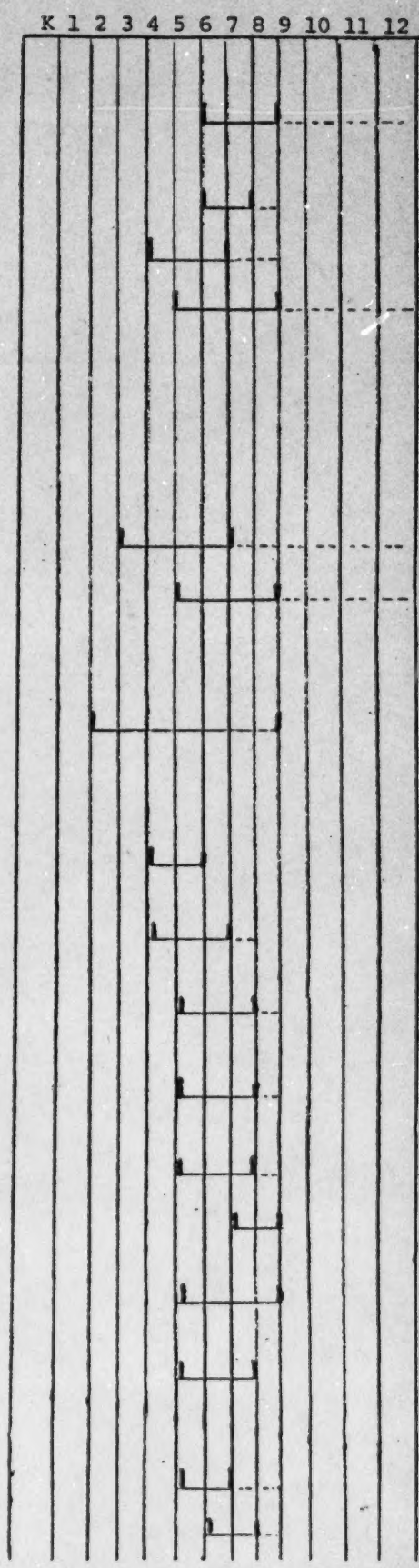
11. Demonstrate ability to check a division exercise by multiplication

12. Demonstrate ability to estimate answers



D. Division of Whole Numbers

1. Know the basic division facts:
   a. through $25 \div 5$
   b. through $81 \div 9$
   c. through $144 \div 12$
2. Demonstrate understanding that division by zero is meaningless
3. Divide a three or four-digit number by a one-digit number, no remainder
4. Divide a three or four-digit number by a one-digit number, with remainder indicated appropriately for the student's developmental level (expressed as a common fraction, decimal fraction, etc.):
   a. remainder
   b. common fraction
   c. decimal
5. Divide a three or four-digit number by multiples of 10 (divisor < dividend)
6. Divide any two whole numbers and express the answer as a quotient which indicates:
   a. remainder equals
   b. mixed number
   c. decimal fraction
7. Demonstrate an understanding of the inverse relationship between multiplication and division
8. Name and identify the parts of a division exercise
9. Write an equation for a word problem involving division and find the answer
10. Demonstrate ability to check a multiplication exercise by division



11. Write a division problem in all three forms

12. Demonstrate ability to use short division with a one-digit divisor

13. Find the average of two or more numbers

14. Demonstrate ability to estimate answer

E. Composite Operations

1. Write equations for and solve word problems involving the sequential application of the basic operations with whole numbers:

   a. two steps

   b. three or more steps

2. Use and explain the use of parentheses, braces and/or brackets in determining the sequence and distribution of the basic operations when solving an equation

F. Multiples and Factors of Whole Numbers

1. State the first three multiples of any given number

2. State the missing multiples in a list of multiples

3. Write a common multiple for a given group of whole numbers

4. Determine whether a given number is prime or composite, or neither

5. Write a given number as the product of its prime factors and the inverse

6. Express prime factors using exponents

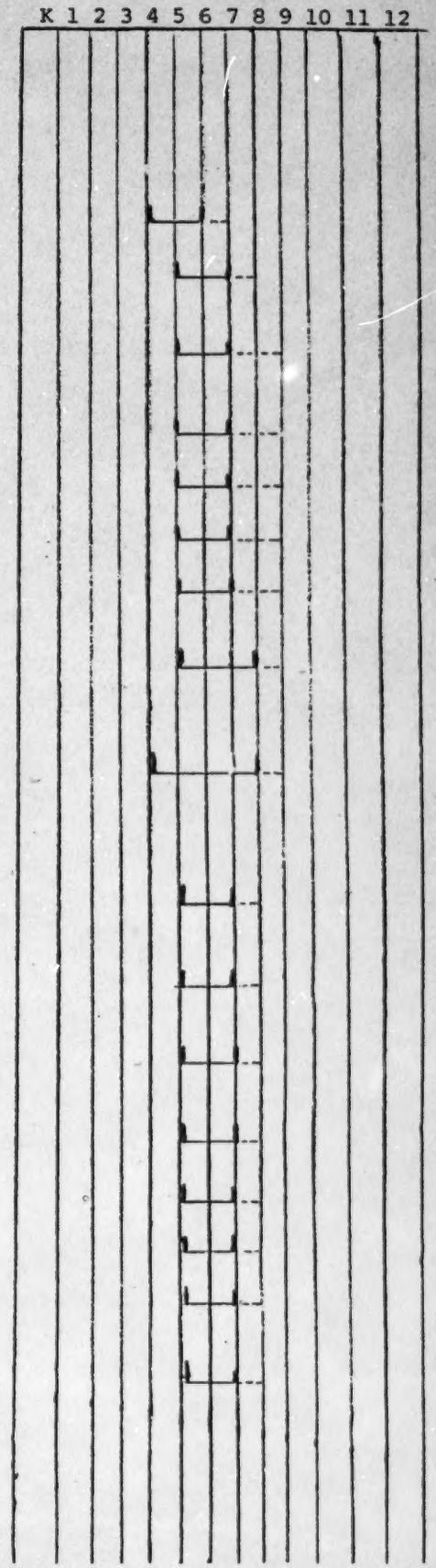
7. State the least common multiple for a given group of numbers

8. State the greatest common factor for a given group of numbers

9. Use test of divisibility for:

   a. 2, 5, 10

   b. 3, 4, 6, 9



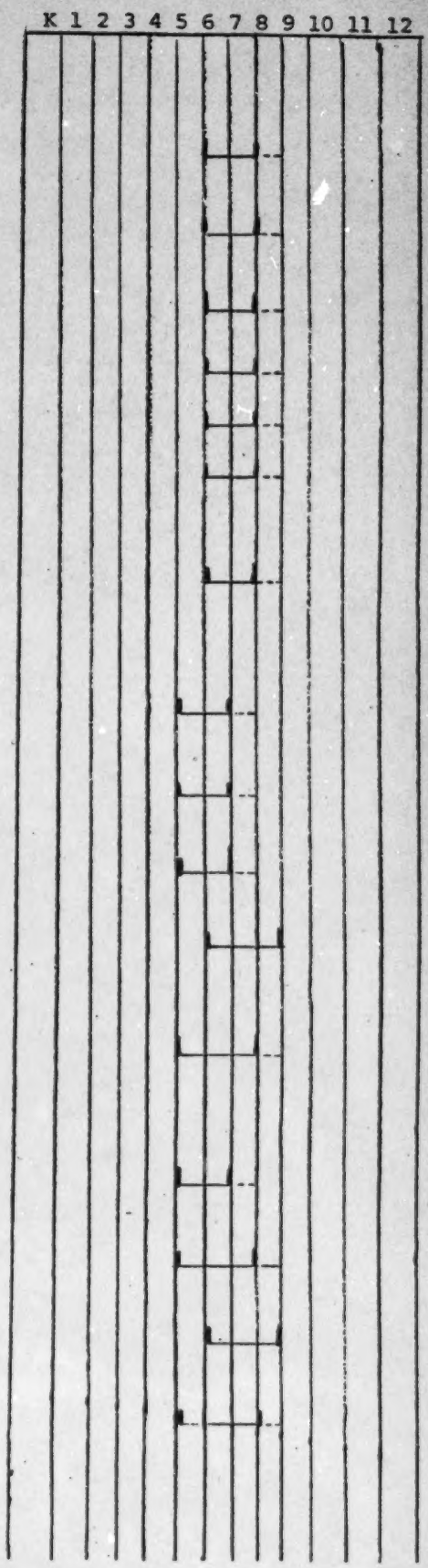
G. Addition and Subtraction of Fractions

1. Add and subtract common fractions with like denominators:
   a. no regrouping*
   b. regrouping necessary*
2. Add and subtract mixed numbers with fractions having like denominators*
3. Subtract a fraction or a mixed number from a whole number*
4. Add fractions with unlike denominators*
5. Add mixed numbers with unlike denominators*
6. Subtract fractions with unlike denominators*
7. Subtract mixed numbers with unlike denominators*
8. Write equations for and solve word problems involving addition and/or subtraction of fractions*

H. Multiplication of Fractions

1. Multiply a fraction by a whole number (numerator = 1)
2. Multiply a fraction by a fraction (numerator $\geq$ 1)
3. Multiply a fraction by a whole number (numerator $>$ 1)
4. Multiply fractions by fractions (numerator $\geq$ 1)
5. Multiply a mixed number by a whole number
6. Multiply a mixed number by a fraction
7. Multiply a mixed number by a mixed number
8. Write equations for and solve word problems involving multiplication of fractions

*All answers reduced to lowest terms



I. Division of Fractions

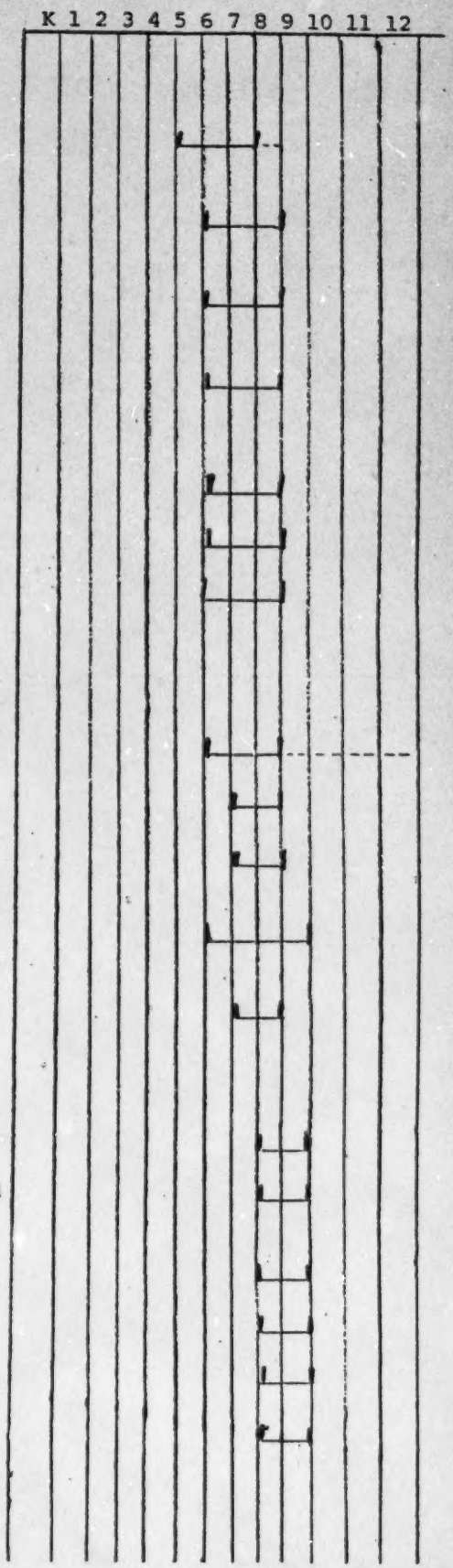
1. Divide a fraction or mixed number by a whole number
2. Divide a whole number by a fraction (numerator = 1)
3. Divide a whole number by a fraction (numerator > 1)
4. Divide a fraction by a fraction
5. Divide a mixed number by a fraction
6. Divide a mixed number by a mixed number
7. Write equations (number sentences) for and solve word problems involving division of fractions

J. Addition and Subtraction of Decimals

1. Add mixed numbers written in decimal form (no regrouping)
2. Subtract mixed numbers written in decimal form (no regrouping)
3. Add and subtract mixed numbers written in decimal form (regrouping)
4. Round sum and differences to prescribed place-value significance
5. Write equations for and solve word problems involving addition and subtraction of decimals

K. Multiplication of Decimals

1. Multiply a mixed number written in decimal form by a whole number
2. Multiply two mixed numbers written in decimal form
3. Round product to prescribed place-value significance
4. Write equations for and solve word problems involving multiplication of decimals



L. Division of Decimals

1. Divide a mixed number written in decimal form by a whole number
2. Divide two mixed numbers written in decimal form
3. Round quotient to prescribed place-value significance
4. Write equations for and solve word problems involving division of decimals

M. Ratio and Proportions

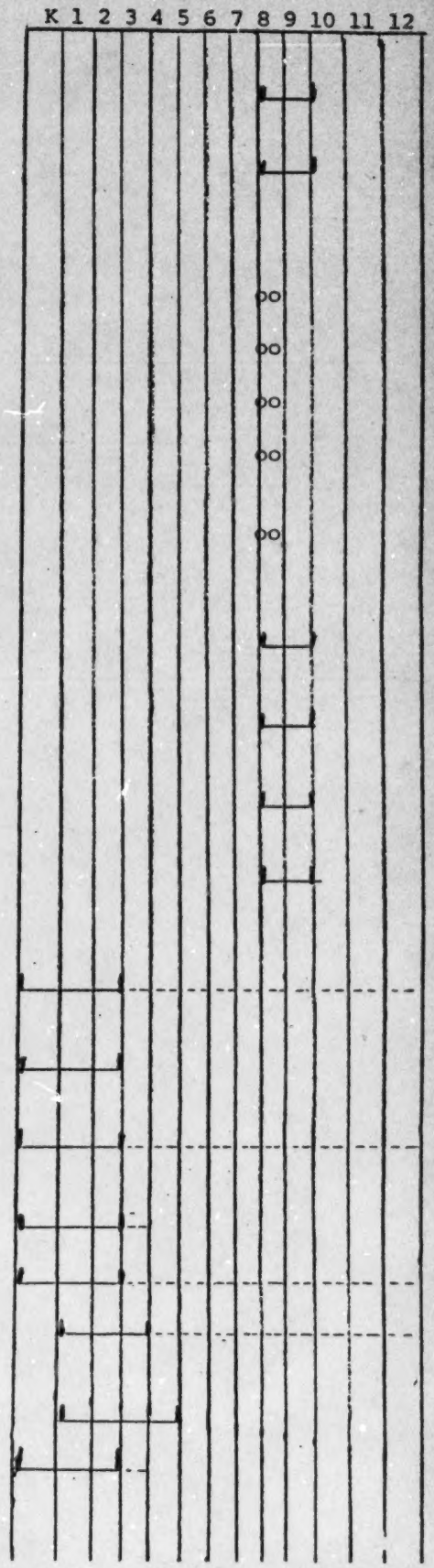
1. Define and apply ratios
2. Define and apply proportions
3. Solve proportions

N. Percents

1. Solve the three cases of percent:
   a. missing percentage
   b. missing rate (percent)
   c. missing base
2. Solve percent word problems of appropriate case
3. Solve word problems including discount, commission, percent of change and interest

O. Operation with Complete Set of Integers (positive and negative)

1. Define the set of integers
2. Compare integers using the symbols $>$, $<$, and $=$
3. Determine the absolute value of an integer
4. Add any two given integers
5. Subtract any two given integers
6. Multiply any two given integers



7. Divide any two given integers

8. Simplify problems involving two or more operations of integers

P. Operation with the Complete Set of Rational Numbers (positive and negative)

1. Add any two rational numbers

2. Subtract any two rational numbers

3. Multiply any two rational numbers

4. Divide any two rational numbers

5. Simplify problems involving two or more operations of rational numbers

Q. Square Root

1. Recognize the square root symbol

2. Find the square root of a perfect square without the use of a table

3. Estimate the square root of a non-perfect square using tables

4. Use Pythagorean theorem to find the hypotenuse of a right triangle

III. Sets and Set Notation

A. Identify sets of objects

B. Given a group of objects, recognize sameness in objects, such as size, shape or color

C. Apply one-to-one correspondence to determine equivalent and non-equivalent sets

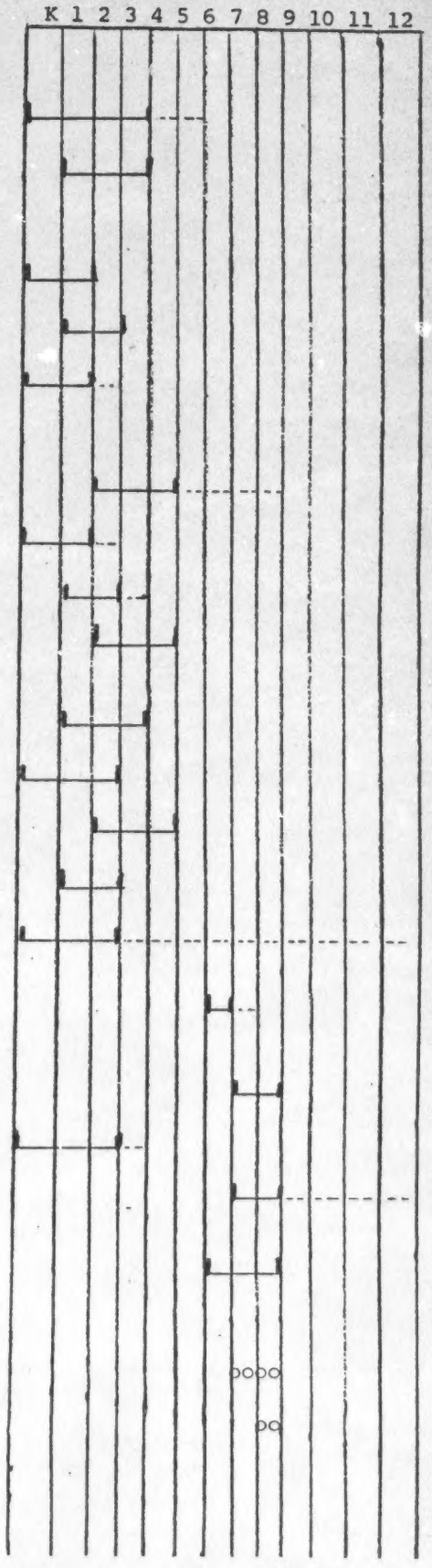
D. Recognize that equivalent sets have the same number of objects

E. Identify equal sets

F. Arrange sets in order of cardinality

G. Recognize the concept of subsets of a given set

H. Recognize a number of a given set



I. Compare sets using the words fewer, more, least, most, as many as

J. Join and separate sets

K. Identify and reproduce numerals of sets:

1. Identify numerals of sets to ten

2. Reproduce numerals of sets to ten

L. Construct a set having the same number of members as a given set

M. Recognize sets of numbers: counting, whole, even, odd

N. Name the cardinal number of a set

O. Write the cardinal number of a set

P. Partition a set into two or more subsets

Q. Relate joining and separating of sets to addition and subtraction of members

R. Construct a set when the number is given

S. Group objects into sets of tens, hundreds

T. Join, separate and compare sets to 18

U. Recognize the empty set

V. Use braces { } to indicate groupings of elements of sets

W. Recognize finite and infinite sets, universal sets and disjoint sets

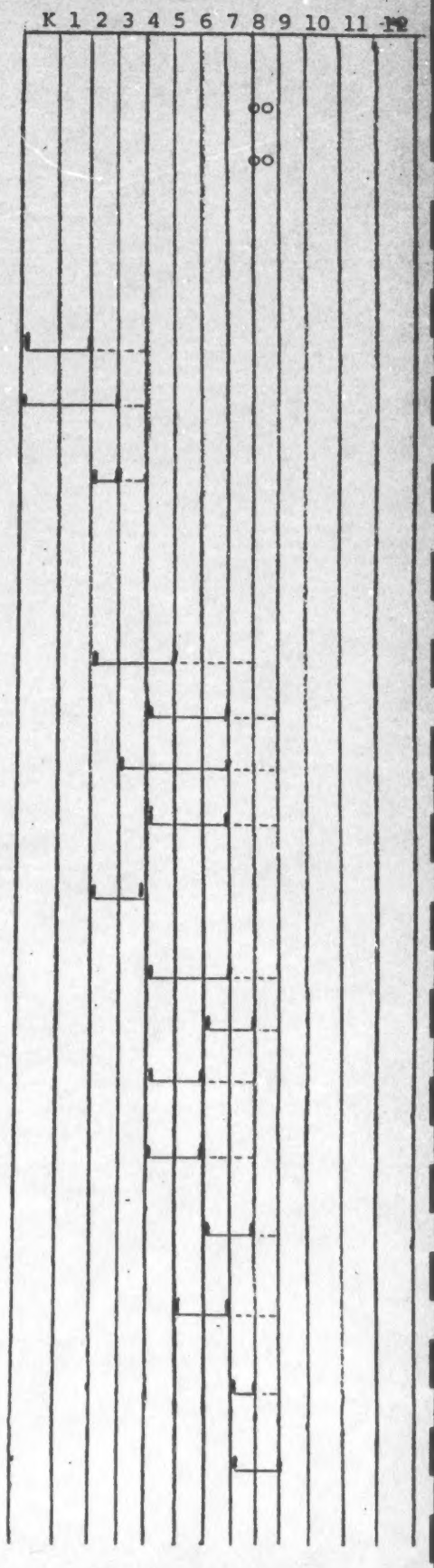
X. Identify members of a set

Y. Recognize and define symbols of set notation:
$\cup, \cap, \subset, \emptyset, [\,], (\,), \{\}, \in$

Z. Name the intersection and union of sets

AA. Draw, label, and interpret Venn Diagrams for disjoint sets, subsets, universal sets, union, intersection

BB. Use set builder notation and truth sets



CC. Explain the meaning of a set expressed by set builder notation

DD. Use truth sets

IV. Geometry

A. Curves

1. Distinguish between straight and non-straight lines

2. Identify inside and outside of closed curves

3. Distinguish between open and closed curves

B. Points, Lines, Line Segments, Rays, Angles, Planes

1. Identify and describe:

a. points and line segments

b. rays, angles, lines

c. lines as horizontal or vertical

2. Identify right angles

3. Describe a given point as inside, on, or outside of a given closed curve

4. Identify and describe parallel, intersecting, and perpendicular lines

5. Use a protractor to measure size of angles

6. Draw the line determined by two given points

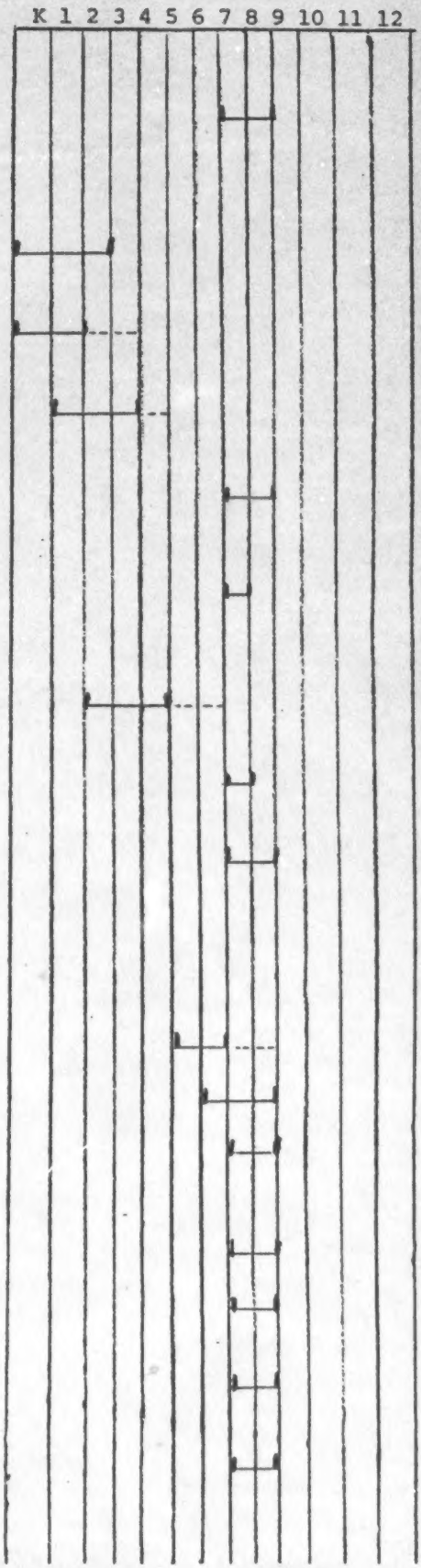
7. Draw a ray given its end point and one other point on the ray

8. Label and describe a given angle three different ways

9. Classify a given angle as acute, right, obtuse, straight

10. Draw the complement and/or supplement of a given angle

11. Classify sets of angles as complementary, supplementary, vertical, adjacent, congruent



12. Determine whether planes are parallel or intersecting

C. Geometric Figures

1. Identify and classify like objects by shape

2. Identify and name: rectangles, squares, triangles, circles

3. Describe characteristics of triangles, squares, rectangles, circles

4. Classify triangles as right, scalene, isosceles, or equilateral

5. Recognize plane figures as faces of geometric solids (cube, cylinder, sphere, rectangular solid)

6. Identify and name solid geometric figures: cube, cylinder, sphere, cone, rectangular solid, pyramid

7. Identify and determine the number of faces, vertices, and edges of a geometric solid

8. Identify the base and altitude of a geometric solid

D. Congruence

1. Identify congruent figures within the following classes:

   a. line segments

   b. angles

   c. plane closed figures

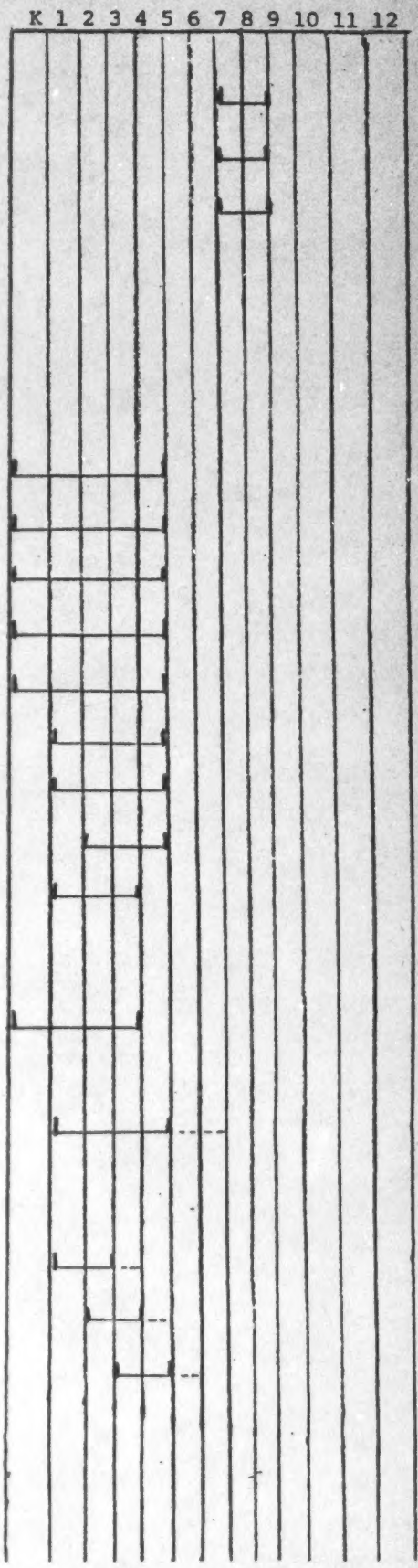
E. Constructions

1. Draw diagonals for given convex polygons

2. Draw a circle given its radius or diameter

3. Draw a general polygon given its name or number of sides

4. Construct a regular square, triangle, hexagon given its name or number of sides



5. Construct a perpendicular bisector to a given line segment

6. Construct an angle equal to a given angle

7. Bisect a given angle

V. Measurement

A. General Concepts

1. Compare properties of objects -- capacity, length, weight, area, etc. - using comparative terms (area - not until third grade):

   a. more than, less than

   b. taller than, shorter than

   c. longer than, shorter than

   d. heavier than, lighter than

   e. larger than, smaller than

   f. greater than, less than

   g. same as, equal to

   h. earlier than, later than

2. Recognize convenience of "standard units"

B. Time

1. Apply general time relationships: yesterday, today, tomorrow

2. Distinguish between the hands of a clock -- minute and hour--and describe their positions at a given time

3. Tell time to the specified interval of accuracy

   a. hour and $\frac{1}{2}$ hour

   b. $\frac{1}{4}$ hour

   c. 5 minutes and 1 minute

4. Set the hands of a clock to read a specified time

   a. hour and $\frac{1}{2}$ hour

   b. $\frac{1}{4}$ hour

   c. 5 minutes and 1 minute

5. Write the time correctly, in words and/or symbols

   a. hour and $\frac{1}{2}$ hour

   b. $\frac{1}{4}$ hour

   c. 5 minutes and 1 minute

6. Convert units: seconds to minutes or hours, minutes to seconds or hours, hours to minutes or seconds

7. Estimate the passage of time: e.g. three days ago, two hours ago, ten minutes ago

8. Read and give specific information from a calendar

9. Perform arithmetic operations and solve word problems involving time

C. Money

1. Name U.S. coins and bills

2. Identify and order the values of U.S. coins and bills in cent and/or decimal notation

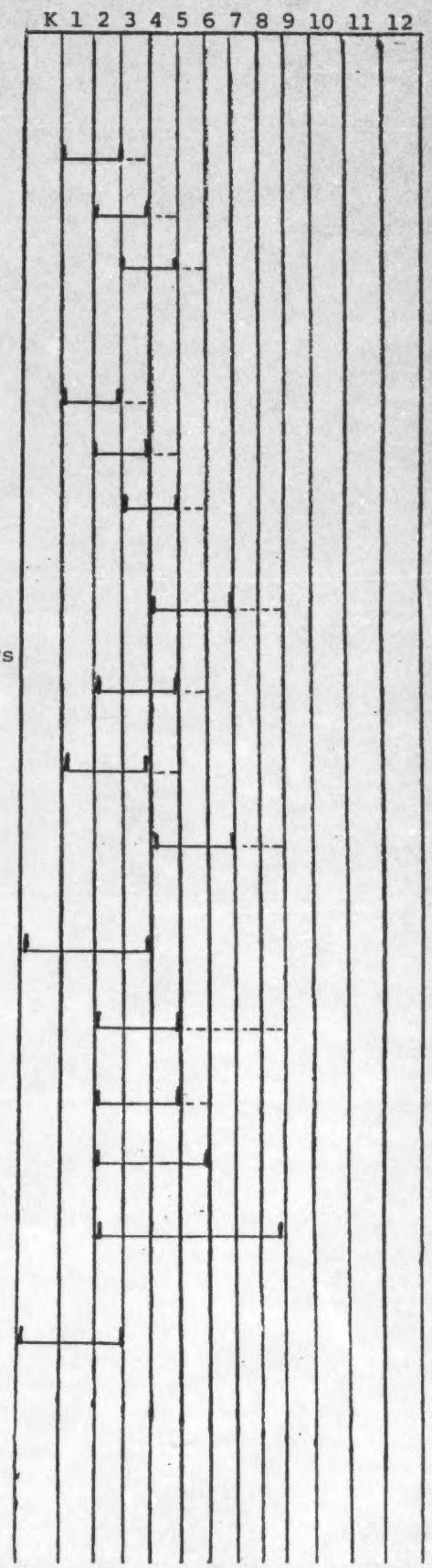
3. Enumerate the bills and/or coins required to equal a specified value

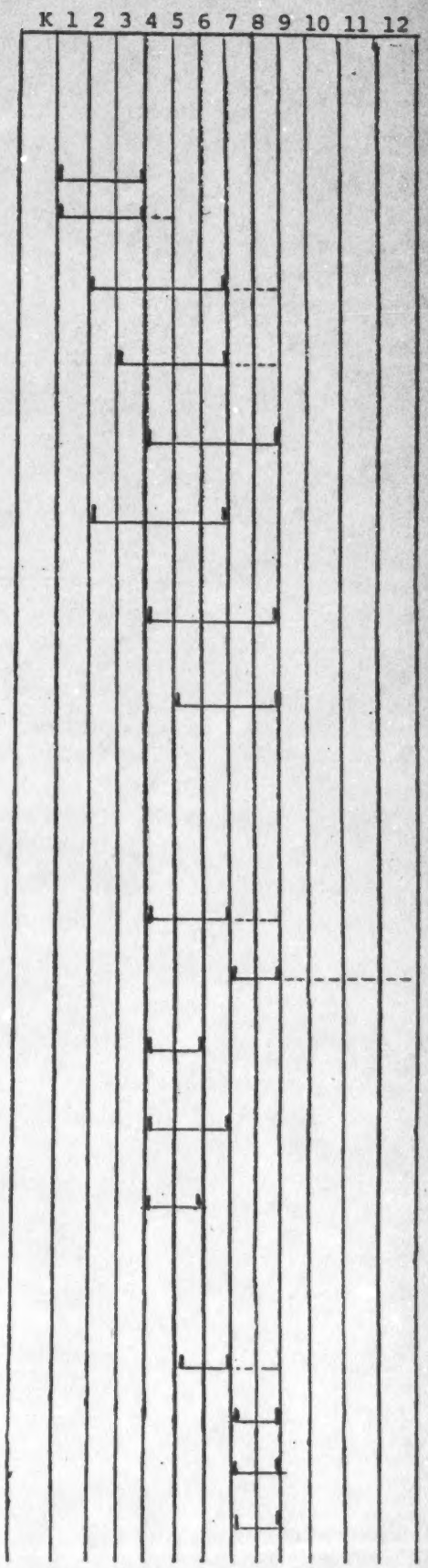
4. Make change

5. Perform arithmetic operations and solve verbal problems involving money

D. Linear

1. Measure lengths with non-standard units





2. Match representations of the common standard English and metric units with their names:

   a. inch, foot, yard

   b. centimeter, meter

3. Measure given lengths, using an appropriate measuring device, to specified accuracy

4. Estimate given lengths, using English and/or metric units, and verify the estimate

5. Convert units (inches to feet and yards, etc., meters to centimeters)

6. Draw lines of specified length within stipulated limits of accuracy

7. Perform arithmetic operations and solve word problems involving units of linear measure

8. Demonstrate ability to draw and interpret scale drawings and maps

E. Perimeter and Area

1. Measure or compute the perimeter (circumference) of a given plane closed figure

   a. polygon

   b. circle

2. Shade in the area of a given plane closed figure

3. Identify fractional parts of an area using simple geometric figures

4. Determine the area of a given plane closed figure by counting unit squares

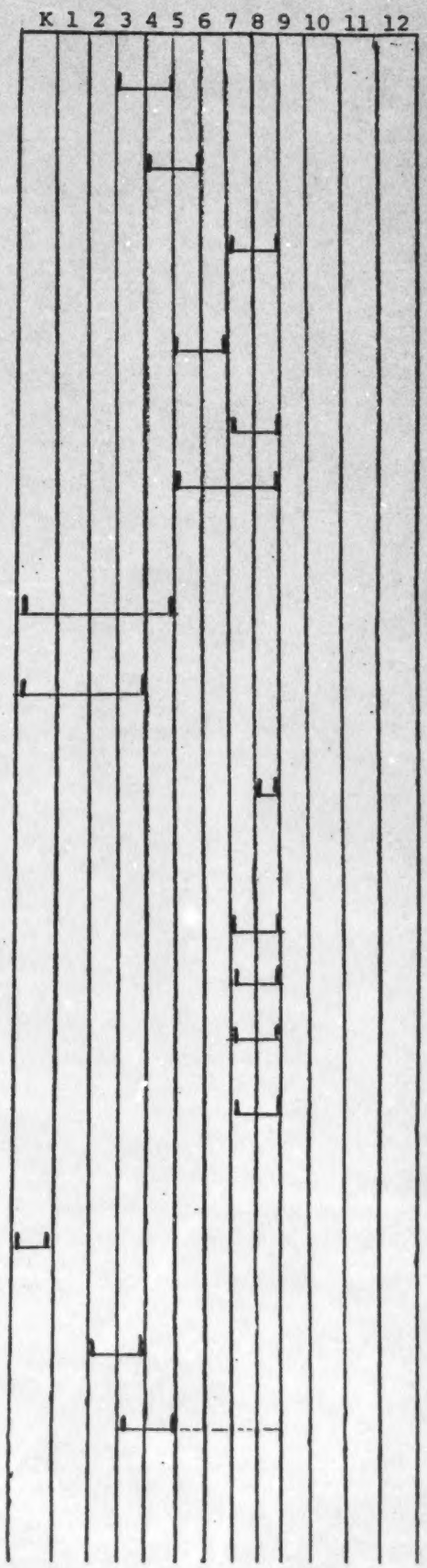
5. Compute the areas, using formulas, of given triangles, squares, rectangles, parallelograms, circles

   a. squares and rectangles

   b. triangles

   c. parallelograms

   d. circles



6. Identify surfaces of greater or lesser area by sight

7. Compare areas of surfaces using units of the student's own creation

8. Compute the perimeters and areas of "non-standard" geometric figures

9. Select appropriate standard units of area measure, based on size of surface and accuracy required

10. Convert from one unit of area measure to another

11. Solve word problems involving area

F. Volume

1. Identify objects of greater or lesser volume by sight

2. Compare volumes of objects using non-standard units

3. Select appropriate standard units of volume measure, based upon size of object and accuracy required

4. Convert from one unit of volume measure to another

   a. English

   b. metric

5. Solve word problems involving volume

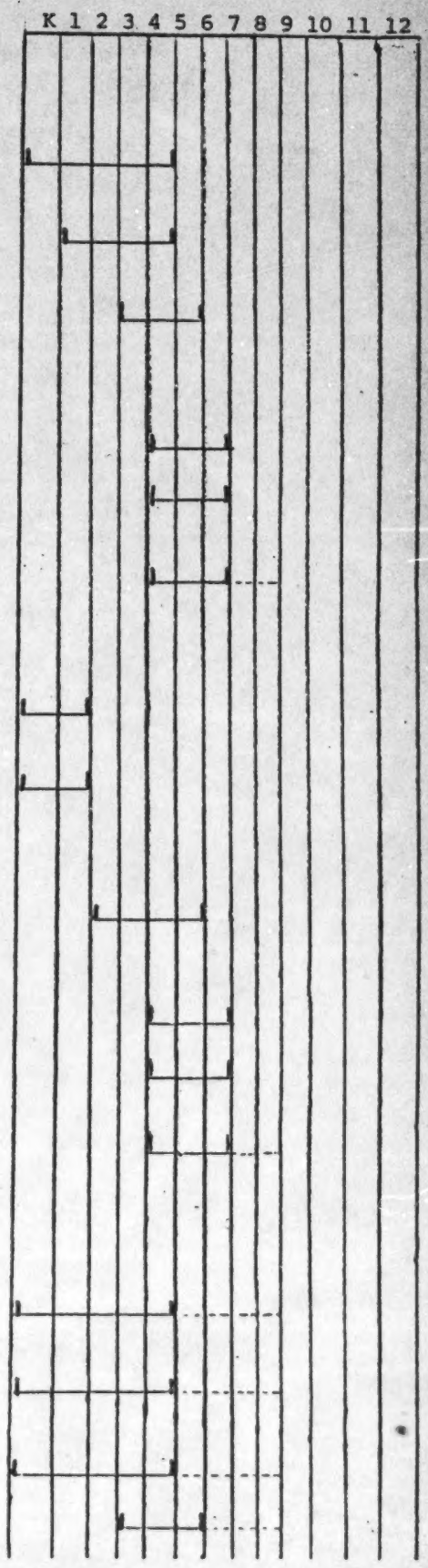
6. Calculate the surface area and volume of a geometric solid

G. Temperature

1. Determine by sense-use which of two objects is hotter or colder

2. Describe the temperature of an object, using a thermometer calibrated in either Fahrenheit or Celsius (Centigrade)

3. Solve word problems involving temperature changes



H. Weight

1. Gauge the relative weights of two or more objects without use of scale or balance

2. Describe the weights of objects using non-standard units

3. Weigh an object, using a scale or balance, and select units appropriate to the object

4. Convert from one unit to another within each system

   a. English

   b. metric

5. Solve word problems involving units of weight

I. Liquid

1. Estimate relative capacities of containers without the use of standard measures

2. Describe the capacity of given containers using non-standard units

3. Describe the capacity of given containers using standard units appropriate to the capacity of the container and the accuracy required

4. Convert from one unit to another

   a. English

   b. metric

5. Solve word problems involving liquid measure

VI. Graphs

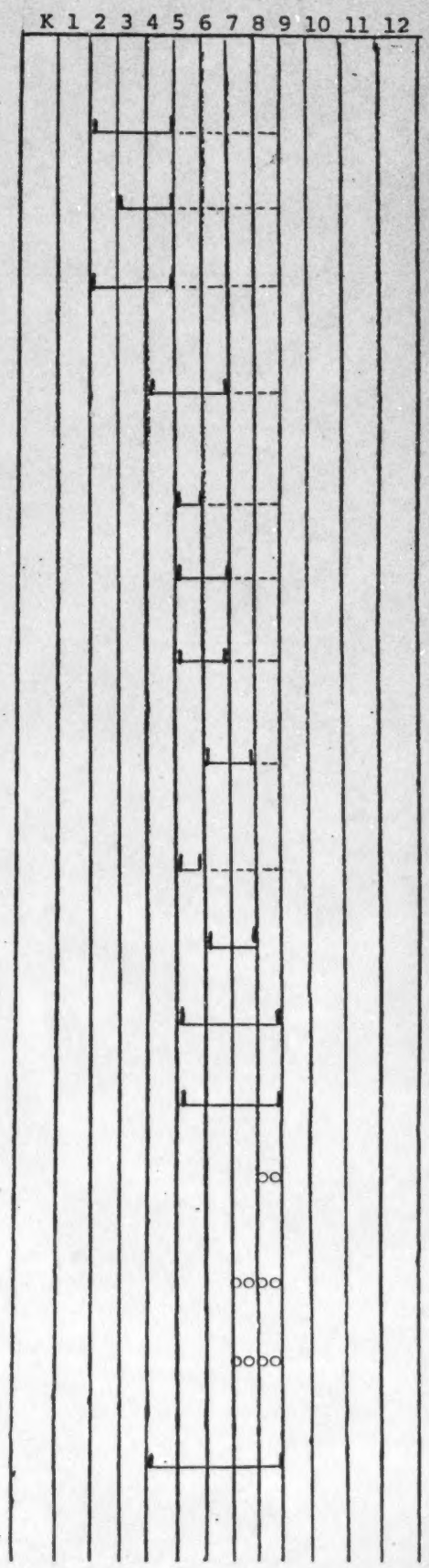
A. Pictographs

1. Identify the graph's purpose

2. Name and explain the units of measurement

3. Answer specific questions about information conveyed

4. Construct a graph of given data, and give a title



B. Bar Graphs

1. Identify the graph's purpose
2. Name the axes and explain the units of measurement
3. Answer specific questions about information conveyed
4. Construct a graph of given data, selecting the axes and scales appropriately, and give a title

C. Line Graphs

1. Identify the graph's purpose
2. Name the axes and explain the units of measurement
3. Answer specific questions about information conveyed
4. Construct a graph of given data, selecting the axes and scales appropriately, and give a title

D. Circle Graphs

1. Identify the graph's purpose
2. Describe the relationship between angle size and proportion of whole represented
3. Answer specific questions about information conveyed
4. Make comparisons based upon the data presented
5. Construct a circle graph, given selected data, using compass and protractor

E. Statistics

1. Draw histograms
2. Find mean, mode, median and frequency distribution

F. Probability

Solve simple probability problems

ALGEBRA I PERFORMANCE EXPECTATIONS

A. Symbols and Sets

1. Graph sets of #'s on the number line
2. Compare numbers using =, <, >,
3. Specify a set by rule or roster
4. Identify a set as finite or infinite
5. Determine all the subsets of a given set
6. Determine intersection and union of two sets
7. Simplify expression by removing parentheses, brackets, braces
8. Simplify expressions by using the rules for order of operations

B. Variables and Open Sentences

1. Evaluate an algebraic expression
2. Identify factors, coefficients, bases, exponents, terms
3. Find the solution set of an open sentence over a given replacement set
4. Graph a solution set of an open sentence
5. Translate symbols to words and words to symbols
6. Solve word problems using open sentences

C. Axioms, Equations and Problem Solving

1. Name the property of equality that is illustrated in a given exercise (reflexive, symmetric, transitive)
2. Name the property (commutative, associative, distributive, multiplicative identity, additive identity, additive inverse, multiplicative inverse) illustrated in a given exercise
3. Determine whether a set is closed under a specific operation
4. Simplify an expression by combining similar terms
5. Solve equations by combining terms and using the transformation principles
6. Solve word problems using the equations mentioned in 5
7. Solve equations having the variable in both members

D. The Negative Numbers

1. Add, subtract, multiply, and divide with positive and negative numbers
2. Determine absolute value of any number
3. Solve simple equations which involve absolute value

E. Inequalities

1. Recognize the property of inequalities used in a given illustration
2. Solve inequalities using the properties of inequality

F. Polynomials

1. Find the sum or difference of any two polynomials
2. Multiply or divide monomials using any of the basic properties of exponents (0 and negative exponents optional)
3. Find product of two polynomials
4. Divide a polynomial by a monomial
5. Divide a polynomial by a polynomial

G. Special Products and Factoring

1. Factor an integer over the set of prime numbers
2. Find all the positive integral factors of a number
3. Find the G.C.F. for a pair of integers
4. Factor a polynomial by removing a common monomial factor
5. Find the product of the sum and difference of two terms
6. Factor the difference of two perfect squares
7. Find the square of a binomial
8. Factor a trinomial square
9. Multiply two binomials at sight
10. Factor a quadratic trinomial
11. Solve a polynomial equation by factoring

H. Fractions

1. Find any value of a variable for which the fraction is not defined
2. Reduce a fraction
3. Multiply two or more fractions

4. Divide fractions

5. Combine fractions with equal denominators

6. Combine fractions with unequal denominators

7. Express a mixed expression as a single fraction in simplest form

8. Simplify a complex fraction

I. Graphs

1. Plot points on the coordinate plane

2. Recognize an ordered pair as a solution of an open sentence in two variables

3. Graph a linear equation in two variables:

   a. Using two points

   b. Using one point and the slope

4. Find the slope of a line graphically or algebraically

5. Find the slope and y-intercept of a line given the equation

6. Write a linear equation given the slope and y-intercept

7. Use the y-intercept and slope to graph an equation

8. Find the equation of the line through a given point with a given slope

9. Find the equation of the line through two given points

10. Graph an inequality in two variables

J. Sentences in Two Variables

1. Recognize that the point at which two lines intersect represents the ordered pair which satisfies both equations

2. Graph two linear equations and determine if the equations are consistent and independent and find their common solution

3. Solve a system of linear equations by the addition or subtraction method

4. Solve a system of linear equations by substitution method

5. Approximate the solution of a system of linear equations by graphing

6. Solve word problems by using systems of linear equations

K. The Real Numbers

1. Rational numbers:

   a. Express any rational number as a quotient of integers

   b. Express any rational number as a terminating or repeating decimal

   c. Find a rational number between any two rational numbers

2. Irrational numbers:

   a. Recognize a given number as irrational

   b. Find the principal root of any perfect square or cube

   c. Simplify a square root

   d. Find the product of any two square roots

   e. Find the quotient of any two square roots

   f. Find the indicated sum or difference of square roots

   g. Find the product of two binomials which contain square roots

   h. Rationalize a denominator which is a square root

   i. Solve simple radical equations

   j. Approximate a square root by divide and average method

L. Ratio, Proportion, and Variation

1. Write the ratio of two numbers as a fraction in simplest form

2. Recognize the equality of two ratios as a proportion

3. Recognize different forms of a proportion

4. Solve a proportion

5. Solve direct and inverse variation problems

M. Quadratic Equations

1. Solve quadratic equations of the form $x^2 = a^2$ by using the property of square roots of equal numbers

2. Solve quadratic equations by factoring

3. Solve quadratic equations by completing the square method (if time permits)

4. Solve quadratic equations by the quadratic formula (if time permits)